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ABSTRACT

The effects of two instructional modes, small group and lecture, were compared in remedial mathematics classes. Sex differences in achievement were also analyzed. Results include: small group instruction had a significantly greater positive impact on achievement than did lecture; females did significantly better than males on posttests in two of the three remedial courses involved. (MP)

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Persistence in Small Group Instruction in Developmental Mathematics Courses --- on Relationships Among Academic Performance, Sex Difference, Attitude, and Persistence. (Presented at the Annual Meeting of American Mathematical Association of Two Year Colleges, Atlanta, Georgia, October, 1977).

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Purpose

Little hard evidence exists to support the contention that college remedial mathematics programs do indeed help students remove or remedy their deficiencies. The purpose of this study was to determine for remedial students the differentiable effects of two instructional modes, centering around, respectively, (1) small group instructional processes (experimental), and (2) lecture-demonstration processes (control). These effects were investigated in relation to (1) academic achievement, (2) attitude toward mathematics, (3) sex difference, and (4) persistence in successfully pursuing subsequent mathematics courses. In particular, emphasis was given to determining if there exists differences between male and female remedial mathematics students with regard to achievement in arithmetic and elementary algebra. Such a determination may prove significant if increasing numbers of females will be seeking to remediate deficiencies in mathematics in order to undertake a wide variety of quantitavity oriented programs.

Methods and Procedures

The study had three phases: (1) a Pilot Phase (N=71 remedial students) to assess instruments, refine procedures, and systematize teaching strategies,

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(2) an Experimental Phase (N=100 remedial students), and (3) a Validation Phase to assess persistence level (N=4701, consisting of 1594 remedial students and 3109 regular program students at 14 junior colleges in the University System of Georgia). Persistence was defined to mean a student in this study who had completed a remedial mathematics course is said to exhibit persistence if the student obtains a grade of "C" or better in a subsequent regular college level mathematics course.

A 2x2 factorial analysis of covariance was employed to test the main hypotheses involving the factors small group instructional processes and sex difference where content posttests were used as dependent variables and pretests were used as covariates. Additional testing involved use of Kendall's tau for tests of associations, and proportionality tests to assess persistence levels.

Results

The results of the study indicated that small group instructional procedures had a significantly greater positive impact ($p < 0.001$) on achievement in arithmetic, elementary algebra, and combined arithmetic and algebra than the lecture-demonstration method. Sex difference, in favor of females, was significant only in regard to algebra ($p < 0.002$) and the combined content ($p < 0.001$). There was no significant interaction between treatments and sex difference except that treatment means were greater than control means in all content areas. Also, females slightly exceeded males in both algebra and combined content achievement. No treatment effects on attitude were discernable. A persistence level of 75 percent for the total experimental group far exceeded (1) the 47 percent level attained by 1594 remedial students at 14 junior colleges, and (2) the 43 percent level for the total control group.

Conclusions

A general conclusion of this study is that it is feasible -- given certain boundary conditions -- to develop a remedial mathematics course whose main instructional focus is on students working in small groups. Among Hemphill and Westie's 14 identified characteristics used to describe groups, this study found that the following appeared to be crucial: (1) flexibility, (2) size, (3) participation, and (4) viscidity. Moreover, participation appears to be a necessary condition and viscidity a sufficient condition for success of task-oriented groups.

A major conclusion was that the significant main effect of small group instructional processes on achievement is predictable from R.S. Zajonc's mathematical model for obtaining optimal division of labor for a given task and a given group.

The critical role played by persistence reported in this study deserves further investigation. It appears that coupling small group instructional processes with Polya type problem-solving heuristics points toward a new strategy for the teaching of remedial mathematics.

Lastly, the frequently held belief that males achieve better in mathematics was not supported by this study. In fact, the reverse was significantly obtained in that females outperformed males in both algebra posttest and the combined arithmetic and algebra posttests. Also, females scored slightly but consistently better on the improvement tests with respect to arithmetic, elementary algebra and combined scores on both subjects.